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ORIGINAL PAPER

The association between dietary diversity, social assistance and coping strategy with household food security during COVID-19 in Tulungagung district, East Java

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Abstract

Background : Food insecurity is still prevalent in Indonesia and COVID-19 impacts led to severe and widespread increases in food insecurity, affecting vulnerable households with impacts expected to continue into 2022 and possibly beyond.

Objective : This study aimed to determine the association between dietary diversity, social assistance, and coping strategies with food security during COVID-19 in Tulungagung, East Java.

Methods : This cross-sectional study was conducted in Tulungagung District, East Java with interviewed using telephone from May to July 2021. Multistage random sampling was conducted to 187 parents (father or mother). The study used structured questionnaire for socio demographic background, Household Food Insecure Assess Scale (HFIAS), dietary diversity scale, coping strategy index instruments to collect the data.

Results : This study found the prevalence of food insecurity in Tulungagung were 56.1%. There was association between income (p=0.021, OR= 2.388(1.123-5.079)), dietary diversity (p=0.007, OR=3.400(1.440-8.200)), number of coping strategies (p=<0.001, OR=10.020(5.055-9.861)), and coping strategies food compromisation (p=<0.001, OR=13.337(5.835-3.485)) with food security.

Conclusions : Most households have faced food insecurity because of lower income during the pandemic, have low dietary diversity, and tend to use coping strategy to survive. By this finding, it is important for government to give priority and focus on vulnerable household in social assistance for the long term and more focused to build up human capital among households through skill and training to ensure the resilience of food security.

Keywords: food security, dietary diversity, social assistance, coping strategy, COVID-19

Introduction

Household food security is a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.[1] Indonesia's food security has improved from 2015 to 2019, which was previously ranked 75 to 62 currently out of 113 countries but more than 20 million Indonesian people still face the risk of hunger and it could get worse because of COVID-19 pandemic. It showed the proportion of households facing moderate or severe food insecurity rose to 11.7% during the

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COVID-19.[2] Impact of food security is a high likelihood that malnutrition will increase across the country as poorer households have to focus on providing sufficient quantities of food to their members rather than the quality of a diversified diet. The worldwide economic consequences of the pandemic harm Indonesia's economy through the drop in trade of goods and services, loss of jobs and income and decreased domestic products. There has been a drastic rise in job losses with more than 6.4 million Indonesians having filed for unemployment and almost three-quarters of households because of pandemic were earning less than they were in January 2020. Due to the current situation, this virus has the potential to severely affect the health and socioeconomic status.[3]

Food insecurity makes families may purchasing more lower-cost, shelf-stable foods that are often less healthy and lower in key nutrients.[4] The multiple consequences of the economic shocks not only included reductions in food consumption and dietary energy intake, but also compromised diet quality and diversity.[5] Significant reductions in the consumption of fruits, vegetables, meat and dairy and shift to nonperishable foods like flour, maize meal and rice has the potential to deepen malnutrition. Poverty also make household cannot afford to purchase food to perform their daily activities or provide adequate housing, quality health care facilities or quality education for their families.[6] Food insecurity is more also likely to happen when there is absence of social assistance. Social assistance can reduce extreme poverty and enhance food security, while also building household resilience in times of crisis.[7] The government has responded swiftly with a scaling up of social assistance programs but challenges with the social assistance database remain, including the risk of missing many of the most vulnerable.[8] Food insecure households also reportedly exhibit a range of coping techniques that reflects their vulnerability. In the phase of shocks such as COVID-19, households may employ food or non-food based coping strategy or a combination of both to protect their basic needs.[9] When the food insecure households adopt different coping strategies, they often also convert to a new livelihood pattern that might make them more vulnerable to under nutrition.[10]

Tulungagung district is areas for agricultural activities and about 60% of people livelihoods are mostly farmers. Tulungagung become one of the food barns in East Java Province to maintain national food security.[11] COVID-19 restrictions adversely affected the agricultural sector as demands for food stuffs fell considerably and also reduce the operation time of traditional markets and even to close them. This policy made it difficult for farmers to sell their products and can impact to their income.[12] Children also face a high risk of malnutrition because low dietary diversity. Toddlers eat a variety of foods reached 59.7%, not yet reached the 80% target in Tulungagung and it can worse because of COVID-19.[13] Unemployment in Tulungagung district reached 4.61%, the highest in the last 3 years and poverty rate in Tulungagung increased from 6.74 to 8.11% during COVID-19.[14]

Research on food security during COVID-19 is very timely during COVID-19 pandemic. Information whether the COVID-19 pandemic may worsen this problem at household level and factors may involve are lacking. Therefore, this study aims to know the association between dietary diversity, social assistance, and coping strategies with food security during COVID-19 in Tulungagung, East Java.

Methods

Subjects and Study Design

The design of this study was cross-sectional study and conducted in May-July 2020. The total sample was 187 parents (mother or father). Sample size was calculated using estimate difference between two population proportions. Total sample was 170 respondents and added by 10% (17 respondents) to secure sample from any drop out or incomplete data, resulting in a total sample size of 187 respondents. Subjects were selected using a probability sampling technique with random sampling. Two villages in Kauman with 100 respondents and Mangunsari with 87 respondents in Tulungagung district were

become representative.

Data collection was conducted by enumerators who have previously been trained for one week. Researcher visit village office to get the list of respondents and get the respondent's telephone number. The researcher and enumerators then contact the respondent to explain about the research through what Sapp text or call and if they agree then they are added to the what Sapp group. The distribution of the questionnaire was carried out using Google Forms and distributed in what Sapp group. The questionnaire consists of 6 parts. Part 1 contains informed consent (willingness), part 2 identity data subject consists of 4 questions, part 3 socio-demographic consists of 7 questions, part 4 social assistance consists of 6 questions, part 5 about impact of COVID-19 consists of 11 questions, part 6 about dietary diversity consists of 16 questions, part 7 about household food security consists of 9 questions, part 8 about coping strategy consists of 10 questions. We interviewed each subject for 30-40 minutes through telephone interview. We used structured questionnaire to assess demographic data, social assistance, and food security status, dietary diversity, and coping strategy. Researcher were measured household food security using the Household Food Security Access Scale (HFIAS), a measure that reflects a household's food security for the previous month. The questionnaire consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity (access), and nine frequency of occurrence questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred.[15] Household dietary diversity were measured using Household dietary diversity scale (HDDS) that reflects household access to a variety of foods.[16] Coping strategy measured using Coping Strategies Index (CSI) that is a series of questions about how households manage to cope with a shortfall in food for consumption.[17]

The questionnaire was pilot tested in a similar population to ensure its applicability in collecting the required data. The inclusion criteria were father or mother who live in Tulungagung for the last 6 months and willing to participate and signed the informed consent. Those who were the presence of severe food allergy or chronic medical problem affecting food intake in household. Sample size was determined based on estimate difference between two populations proportions with specified absolute precision with samples was 187 subjects.

Data Collection

Data collection was conducted from May to July 2021 after it was submitted and approved by the Ethics Committee of Faculty of Medicine, University of Indonesia – Cipto Mangunkusumo Hospital (KET.425/UN2.F1/ETIK/PPM.00.02/2021). There were 5 enumerators that have experienced become enumerator related to public health and been trained for one week in this study. Data obtained through the telephone interview process.

Sociodemographic data

Subject's sociodemographic data including age, education, occupation, income, marital status, number of children, number of household member, and type of family were obtained through telephone interviews. Education was categorized into high (graduated from senior high school and above), and low (graduated from middle high school and below). Occupation was categorized into employee and not employee. Income was categorized into two groups, more than, and less than or equal to the value of minimum wage (UMK) in Tulungagung (Rp 2,000,000). Marital status was categorized into two groups, married and divorced. Number of children was categorized into <3 and ≥3. Number of household member was categorized into two groups, ≤4 and >4. Type of family was categorized into two groups, nuclear and extended family.

Dietary Diversity

The assessment of dietary diversity was done through an interview by 5 enumerators using a household dietary diversity score (HDDS to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. Household Dietary Diversity Score (HDDS) calculated by summing up the number of food or food group eaten

over the past 24h by any member of the household (19). In total, the 12 food groups (FG) were as follows: (FG1) cereals; (FG2) tubers and roots; (FG3) vegetables; (FG4) fruits; (FG5) meat, poultry, organ, etc.; (FG6) eggs; (FG7) fish and others seafood; (FG8), pulses, legumes and nuts;(FG9), milk and other dairy products; (FG10) oils and fats and butter; (FG11) sugar and honey; and (FG12) miscellaneous foods such as condiments and processed foods like snacks, and beverages. We assigned values for each group as '0' for the negative answer (not consumed), or '1' for the positive answer (consumed). Category for formula based on HDDS Indicator with lowest dietary diversity ≤3 food groups and high dietary diversity ≥6 food groups .[16]

Social Assistance

Social assistance was performed to obtain data about social assistance refers to government programs that provide a minimum level of income support to individuals and households living in poverty and what kind of program the received either in the form of direct cash transfers or through a variety of in-kind benefits.

Coping strategies

Coping strategies were performed to obtain data about behaviours developed, the main question becomes how often in the past one month had to rely on each individual coping behaviour. The coping strategy adapted in this study consists of nine questions. Each question shows the strategy taken by the respondent to ensure that they have enough food to consume despite financial or food shortage. There are 3 question which is the type of coping strategy that most adopted by the respondents, the frequency of coping strategy adopted by the respondents that being categorized into food compromisation, financial, and both food compromisation-financial coping strategy and the number of coping strategies adopted. Food compromisation consist of consume less preferred/less expensive food, limit portion size at mealtimes, try to grow food plants by own selves, reduce number of meals eaten a day, and restrict adult consumption for small children to eat, not eating at all. Financial consist of borrow food or money from a friend or relative, borrow money to buy food, purchase food on credit. [17]

Household Food Security

Researcher were measured household food security using the Household Food Security Access Scale (HFIAS), a measure that reflects a household's food security for the previous month. The questionnaire consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity (access), and nine frequency of occurrence questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred. The respondent will be asked about whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks. The HFIAS score range from food secure with Food secure (score 0-1), Mildly food insecure (score 2-8), Moderately food insecure (score 9-16), Severely food insecure (score 17- 27).[18] After that HFIAS classification converted into binary classification with food secure score (0-1) and food insecure score (2-27). The higher the score then more food insecurity (access) the household experienced. The lower the score then less food insecurity (access) a household experienced. [15]

Statistical Analysis

Data were analyzed by using IBM SPSS version 20.0. Normality test was done by using Kolmogorov Smirnov. The data distribution was considered normal when the p value > 0.05. Continuous data were presented in the form of mean ± SD or median (minimum-maximum). Categorical data were presented in the form of a frequency distribution (n, %). Descriptive statistics of age were expressed as as median (min-max). Bivariate analysis was conducted using chi-square to identify any potential associations between variables and household food

insecurity and to assess crude odds ratio. The level of significance was set at $p<0.05$.

Results

Socio demographic, dietary diversity, social assistance, coping strategy and food security distribution

The respondents analysed in this present study were 25-77 years old (median = 38 years old). Respondents were 181 mother and 6 father. Overall, the prevalence of parents who have high education s 70.1%, who married 84%, who have <3 children 75.9%, who have children under 5 <3 97.9%, number of household member who have ≤4 member 72.7%, nuclear family 75.4%, and employed 61%, income 68%, and food expenditure 81.3%. Distribution of Household's sociodemographic was presented in **Table 1.** Most of the household received social assistance from government 71.7% and village cash transfer was the most common assistance received by the households 47.1%. The majority of household have low dietary diversity 77.5% and cereals consumed by all households. Household in a situation that have urgency to meet food adopted coping strategy 89.8% and most of them using both coping strategy 89.8%. More than half of the household food secure 56.1%. Distribution of dietary diversity, social assistance, coping strategy, and food security was presented in

Table 2.

Table 1. Sociodemographic data of the household (n=187)

Sociodemographic	Frequency (n)	Proportion (%)
Age	38 (25-77) *	
25-45	121	64.7
46-65	58	31
>65	8	4.3
Sex		
Female	181	96.8
Male	6	3.2
Educational		
Elementary School-junior	56	70.1
Senior highschool-university	131	29.9
Marital status		
Married	158	84.5
Divorced	29	15.5
Number of children		
<3	142	75.9
>3	45	24.1
Number of household member	136	72.7
≤4	51	27.3
>4		
Type of the family	141	75.4
Nuclear	46	24.6
Extended		
Occupation of parents	114	61
Employed	73	39
Not employed		
Income	127	68
Below minimum wage	60	32
Above minimum wage		

Table 2. Distribution of dietary diversity, social assistance, coping strategy, and food security

Sociodemogaphic	Frequency (n)	Proportion
Social assistance received		
Yes	134	71.7
No	53	28.3
Social assistance programs		
Food aid	42	22.5
Village cash transfer	88	47.1
Electricity subsidy	37	19.8
Family hope program	23	12.3
Pre employment card program	28	15
Household dietary diversity		
High dietary diversity	42	22.4
Low dietary diversity	145	77.5
Coping strategy adopted		
Yes	168	89.8
No	19	10.2
Food compromisation coping strategy		
Yes	117	62.6
No	70	37.4
Financial coping strategy		
Yes	137	73.3
No	50	26.7
Both coping strategy		
Yes	168	89.8
No	19	10.2
Household food security		
Food secure	105	56.1
Food insecure	82	43.9

The association between dietary diversity, social assistance, coping strategy with food security

Using Chi Square test, this study found no association between age (p=0.853), gender (p=0.128), education (p=0.886), employed (p=0.228), number of children (p=0.927), family member (p=0.149), family type (p=0.229), social assistance received (p=0.313), coping strategies financial (p=0.330), both coping strategies (p=0.335) with food security. However, there was a positive association between income (p=0.021, OR= 2.388(1.123-5.079), dietary diversity (p=0.007, OR=3.400(1.440-8.200), number of coping strategies (p=<0.001, OR=10.020(5.055-9.861), coping strategies food compromisation (p=<0.00, OR=13.337(5.835-3.485) with food security. Analyses of associated factors between socio demographic, dietary diversity, social assistance, coping strategy with food security were summarized in **Table 3.**

Table 3a. The association between dietary diversity and household food security (n=187)

	Food Security (n, %)		Total	p-value*	OR (CI 95%)**
	Food Insecure	Food secure			
Dietary diversity					
Low dietary diversity	49 (53.8)	42 (46.2)	91	0.007	3.400 (1.440-8.200)
High dietary diversity	33 (34.4)	63 (65.6)	96		

*p-value<0.05
*Crude OR

Table 3b. The association between social assistance and household food security (n=187)

	Food Security (n, %)		Total	p-value*	OR (CI 95%)**
	Food Insecure	Food secure			
Social assistance received					
Yes	61 (46.2)	71 (53.8)	132	0.313	0.719 (0.378-1.367)
No	21 (38.2)	34 (61,8)	55		

*p-value<0.05
*Crude OR

Table 3b. The association between coping strategy and household food security (n=187)

	Food Security (n, %)		Total	p-value*	OR (CI 95%) **
	Food Insecure	Food secure			
Number of Coping strategies					
≤1	17 (21.1)	76(78.9)	93	<0.001	1.020(5.055-9.861)
>1	47 (17.6)	47 (82.4)	94		
Coping strategies financial					
Yes	63 (46)	74 (54)	137	0.330	1.389 (0.176-2.694)
No	19 (38)	31 (62)	50		
Coping strategies food compromisation					
Yes	74 (63.2)	43 (36.8)	117	<0.001	3.337 (1.835-3.485)
No	8 (11.4)	62 (88.6)	70		
Both Coping strategies					
Yes	90 (53.6)	90 (53.6)	19	0.335	3.250 (1.035-3.201)
No	4 (21.1)	15 (78.9)			

*p-value<0.05
*Crude OR

Discussion

Educational status is recognized to be not associated with household food insecurity in this study (p= 0.886). In contrast, association between education and food security was found from studies in Zimbabwe and Malaysia.[19,20] Alongside improving the household's income and access to food, education also provides employment opportunities. Education additionally helps farmers to adopt new technological inputs into agriculture, the proper application of fertilizers and engagement in other activities to generate income for the household, which enhances the household food security. A higher level of educational attainment amongst the household heads, especially women, influences proper food preparation and good nutrition practices.[21]

Employment status is recognized to be not associated with household food insecurity in this study (p=0.228). This finding consistent with the previous study which stated that there is no relationship between employment status and food security in Bangladesh.[20] In contrast, association between employment status and food security was found from studies in Iran.[22] This probably due to high unemployment rates among low-income populations make it more difficult to meet basic household food needs.[23] Number of children is recognized to be not associated with food security in this study (p=0.927). This finding consistent with the previous study which stated that there is no association between number of children and food security in India.[24] However, studies in Iran have shown that in poverty-stricken communities with inadequate household food access, some children grow and develop normally as a result of positive family and caregivers' behaviour. Good care practices include proper feeding, home health care, food preparation, hygiene and the provision of a responsive and stimulating environment to children during their most vulnerable stages.[25] Family member is recognized to be not associated with household food insecurity in this study (p=0.149). This finding consistent with the previous study which stated that there is no association between family member and food security in Indonesia.[26] In contrast, association between family member and food security was found from studies in Bangladesh.[27] A large family size puts an extra

burden on food consumption, and more likely to experience food insecurity in contrast to households with a small family size.[21] Family type is recognized to be not associated with household food insecurity in this study (p=0.229).[20] This finding consistent with the previous study which stated that there is no association between family type and food security in Indonesia.[26] It might be because of the household can reduce the adverse consequences of food insecurity if other household members are able to contribute to the total household income. In contrast, association between family type and food security was found in Jordan.[28] This implies that if number of households increases by 1 person, then food security status of households would decrease because an extended household affects the availability of food per capita in the family.[29] Marital status is recognized to be not associated with household food insecurity in this study (p=0.601).[20] This finding consistent with the previous study which stated that there is no association between marital status and food security in Indonesia.[26] The absence of the association can be attributed to the fact that majority of single-headed households are headed by females. Similar to the case of single-headed households, the female spouse in double-headed households is usually the one who looks for money and manage the income to solve family problems. In contrast, association between marital status and food security was found in Malaysia.[30] Higher prevalence of food insecurity was associated with the mother's status, whether single or separated, divorced, widowed, or married.[31] Social assistance received (government) is recognized to be not associated with food security proven by the (p=0.313). It has been shown that a one-off increase in social assistance benefits leads to a significant decrease in moderate and severe food insecurity. The study showed that 80% of households in Australia that benefit from financial social assistance also experienced a lack of food security. Thus, increasing financial social assistance may reduce severe effects associated with food insecurity in households. For example, in Newfoundland and Labrador in Canada, food insecurity dropped significantly in 2007–2011 because of social assistance reforms.[32]

However, there was a significant association in the bivariate analysis. Family income is recognized to be associated with household food security in this study (p=0.021). Studies conducted in Ghana demonstrated that monthly household income increased household food security by 1.65 times.[33] Due to their low socioeconomic status, poor households are not able to be food secured and acquire sufficient resources. This renders them vulnerable to limited access to food, which could further its redistribution to household members.[31] Study conducted in Vietnam which stated that the majority of respondents 66.9% had a decrease in household income due to COVID-19.[34] A study on Nepal also reports that 33.2% of respondents had a reduction in income and 5.4 percent job loss attributed to the COVID-19 pandemics.[35] The COVID-19 outbreak is adversely affecting the economic livelihoods and revenue of families. The low level of payment and the declining purchasing power of food tended to lead a less varied food. The higher a household's access to food, the higher the food security.[36] Significant association was also found between dietary diversity and household food security (p=0.007). Study in Kenyan showed that household dietary diversity scores fell from 9.5 to 8.6 during COVID-19.[37] The effects of COVID-19 on food systems in low-income and middle-income countries would include disruptions in food supplies as a result of restrictions on the movement of people, export restrictions that disrupted trade flows and supply chains including for staple foods (such as wheat and rice), economic downturn and loss of income. The impacts of these were expected to include decreased availability of food and increased food prices, resulting in lower access to food and shifts in consumer demand toward cheaper and less nutritious foods.[38] Disruptions to food transport or the lack of means to transport food commodities for sale would also have led to losses for farmers. Additionally, limited access to inputs (e.g., seeds and fertilizers) would have decreased production. A previous study performed in Ethiopia found that COVID-19 disruptions affected vegetable farmers because of limited access to services and the unavailability of on-farm labour, as well as increased production costs and decreased availability of inputs. The study found increased

food prices as a result of lower agricultural production and the need to import foods.[39] The study in Burkina Faso, Ethiopia and Nigeria also found that decreased crop production was associated with less diverse diets.[40] Previous findings in India also found that crop production can influence dietary diversity through production diversity and income pathways. The effects of COVID-19 on agriculture production and dietary diversity could be partially attributable to disruptions of supply chains, including for inputs, delayed or lower harvests, damage of perishable produce, and loss of income for farmers.[41] Various coping strategies were done by the households to overcome the food insecurity condition by doing food compromisation (quantity and quality of food) or financial coping strategies. From analysis, we found that coping strategies compromisation have a significant relationship with food security (p=<0.001). This result same with the previous study in Nigeria, the widely adopted food coping strategies by rural households during COVID-19 pandemic were eating less expensive food, reducing rational consumption, allowing children to eat first, and skipping meal within a day.[42] Study in Jordan also showed that food-related coping strategies studied were significantly associated with food insecurity at both levels ($p < 0.001$).[43] Furthermore, the association between food insecurity and food-based coping strategies was studied in food-insecure households in Ethiopia and it showed that most households responded to food insecurity by managing food left in their homes.[44] Similarly, a study of Vermont households revealed that food-insecure participants adopted food-related coping strategies significantly more than food-secure households. It is obvious that adopting food-related coping strategies is common for dealing with food insufficiency, which highlights the seriousness of the problem, especially among food-insecure households in the context of the COVID-19 pandemic.[45] From analysis, we also found that coping strategies have a significant relationship with number of coping strategies (p=<0.001). The more severe food insecurity status the higher proportion of coping strategies adopted.[46] Study in Bangladesh showed that one third of the households applied three to four coping strategies.[47] Similarly, study in Africa showed the more severe food insecurity status the higher proportion of coping strategies adopted.[48] Coping strategies can help to determine the food access level and identify the most vulnerable households.[49]

This study has limitation with using telephone interview which may suggest sampling bias by chance excluding those who do not have internet access. This may reduce the generalizability of the findings and because they cannot meet face-to-face or make video calls, it cannot validate the food diversity variable. In addition, although the dietary diversity scores can help determine food accessibility, they do not capture the amount of actual food consumption by households, and nor do they capture changes or reductions in diversity within food groups, which is important for food security. However, to the best of our knowledge, it was the first study in Tulungagung that measured household food security during the COVID-19 pandemic. This study also addressing multiple dimensions of food security so it can describe the vulnerability of the respondents. Tulungagung as a food barn that can affect the food security of other regions so that this research can be a good reference in looking at food security in Indonesia.

Conclusion

The outcome of this research revealed that 56.1% of the households were food insecure during COVID-19 pandemic. Food insecurity was significantly associated with household income, dietary diversity, coping strategy food compromisation, and number of coping strategies. By this finding, it is important for government to give priority and focus on vulnerable household in social assistance for the long term and more focused to build up human capital among households through skill and training to ensure the resilience of food security. This study also needs a support for further analysis and deeper understanding to be conducted in the future studies.

Conflict of interest

Authors declare no conflict of interest regarding this article.

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